

Article

Influences of Learning Approaches, Student Engagement, and Satisfaction with Learning on Measures of Sustainable Behavior in a Social Sciences Student Sample

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Abstract: In this empirical study, we address the relationship between the dimensions of learning in higher education (i.e., student engagement, approaches to learning, and satisfaction with learning) and sustainability (i.e., austerity altruistic, pro-ecological and equitable behavior). The results demonstrate that there is a positive linear relationship between engagement with learning and deep and strategic approaches, motivation and strategies, and altruistic, equitable and pro-ecological behavior. Austerity, however, only correlated with high dedication to learning. Satisfaction with learning was associated with altruistic and equitable behavior and an overall measure of sustainability, and was independently associated with austerity and pro-ecological behavior. Engagement with learning was associated with sustainable behavior, especially with altruistic and pro-ecological behavior in its three expressions, namely, vigor, absorption and dedication. In contrast, austerity was found to be only associated with engagement with learning. As a whole, and in line with Bronfenbrenner's theory, the results of this study suggest that the aforementioned systems are interconnected and mutually influence each other.



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Keywords: sustainable behavior; learning approaches; learning styles; student engagement; satisfaction with learning

1. Introduction

The World Commission on Environment and Development defines environmental sustainability as “meeting the resource and service needs of current and future generations without compromising the health of the ecosystems that provide them” [1] (p. 5). As the problem of environmental sustainability is extremely complex, a multidisciplinary approach should be adopted and a variety of methods used to study all related aspects and determinants. In addition, this challenge requires changing attitudes and behaviors in a multiplicity of contexts. One of these contexts is education, which is given priority, since education is “the foundation on which to build peace and drive sustainable development” [2] (p. 3). Education is particularly relevant to achieving sustainability [3], transversal to many sustainable development goals [4] and a key feature of Goal 4 (i.e., “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”) of the 2030 Agenda for Sustainable Development [5].

To attain a sustainable world, it is necessary that educational institutions, from Elementary School through College, encourage their students to acquire the competencies needed to be able to act as sustainable citizens. In the educational sphere, the design of curricula, teaching practices and mentoring actions should be aimed at helping students develop the academic and human skills necessary to become citizens committed to sustainability.

In this sense, although progress in higher education remains limited [6], there is international consensus on the need that citizens acquire values and adopt behaviors which give rise to more sustainable lifestyles [7]. It is essential that sustainability aspects related

to each specialty are integrated in the curricula of university degrees. But it is rather more important that students develop “cross-cutting sustainability competencies . . . enabling individuals to contribute to sustainable development by promoting societal, economic and political change, as well as by transforming their own behavior” [8] (p. 10). It is crucial “to train student in competences that enable them to be global citizens” [9] (p. 4). In higher education, these competencies “describe the specific attributes individuals need for action and self-organization in various complex contexts and situations and include cognitive, affective, volitional and motivational elements” [8] (p.10). In higher education, “the fulfillment of the sustainable development goals requires the training of students in both specific and transversal [competencies]” [9] (p. 2) that “must be worked on through strategies and teaching methodologies and they must be evaluated” [9] (p. 3). Sometimes, the study of sustainable development goals is part of the academic content of courses, and different activities are developed in order to facilitate learning and interiorization by students. However, the ideal situation is that in which “the development of these competencies should be done transversally throughout the whole curriculum” [9] (p. 13). To effectively promote sustainable development goals in this context, research on “teaching, commitment to society, governance, and the university environment” [9] (p. 4) should be aligned and directed toward the same goal.

With regard to the impact of educational experiences on pro-environmental behaviors, previous studies on the interplay between attitudinal determinants, interactions with nature and pro-environmental behaviors [10,11] have demonstrated that personal experiences with nature [10–12] determine attitudes towards the natural environment. Correlational studies have shown that being physically disconnected from nature may cause a sense of not being part of the ecosystem, which leads subjects to reduce behaviors related to the protection of the environment [13]. In experimental studies, exposure to nature has been associated with cooperative and sustainable intentions and behavior [14]. This association has been linked to positive moods and emotions [15,16] and facilitates self-control and prosocial behaviors [17]. As a whole, these studies:

- (1) Identify the factors that mediate the influence of educational experiences (e.g., the longer and the more direct contact or immersion in nature is, the stronger the influence of these factors is) [14].
- (2) Show the relevance that affective (e.g., positive or negative emotions associated with nature), behavioral (e.g., defense and protection of the environment and recycling behaviors expressed in lifestyle), and cognitive (e.g., beliefs, rules) aspects have in relation to environmental sustainability; and
- (3) Show the significance of educational experiences and their association with the education, development and behavior of students beyond the limits of the educational context.

In relation to education, aspects traditionally linked to positive learning outcomes such as motivation, engagement, the use of learning strategies, or expressions of intelligence are generally conceived as individual dimensions of the student, and their influence has only been assessed in the academic context. Some studies have also been conducted to assess the impact of these elements on other nonacademic domains. In his ecological systems theory, Bronfenbrenner [18] explained that individuals interact with a diversity of systems, and described the mechanisms that govern such interactions. Studies based on Bronfenbrenner’s theory describe the interplay between academic and nonacademic contexts and the influence of extra-academic contexts on the motivation [19], engagement [20,21], disengagement [22], decision-making [23], mentorship, social relationships, mental health, and postgraduation expectations [20] of students. The interplay between systems has also been demonstrated in studies on environmental aspects related to sustainability such as the reduction of inequality in education [24], environmental volunteering [25], and the integral development of social communities [26]. In addition, previous studies have shown the influence of higher education institutions on students’ behaviors impacting on sustainable competences [27–29], learning methodologies [30], information and communication technologies [30], or cognitive operations [31]. This study proposes to extend the research

about of these factors to the study of the influence of aspects related to the academic and learning context, such as student's engagement and satisfaction with learning, and learning approaches, on sustainable behaviors in terms of austerity, altruistic, pro-ecological, and equitable behaviors. These are "instances of sustainable behavior" [32].

Such a proposal is directly related with the philosophy of the 2030 Agenda for Sustainable Development. This is "a plan of action for people, planet and prosperity" [5] (p. 5) whose goals are shown in Table 1, and that requires the active involvement of "Governments, international organizations, the business sector and other non-State actors and individuals" [5] (p. 11) to implement concrete actions that will lead to achieving the outlined objectives. In reference to altruistic and pro-environmental behaviors, they are means of achieving sustainable development. Given that this "claims for the active protection of natural resources while, at the same time, meeting the needs of people" [32] (p. 712), these "instances of sustainable behavior" [32] (p. 712) are mainly related with Goals 8 and 16, and 6, 7, 11, 12, 13, and 14, respectively.

Table 1. Sustainable Development Goals established by the United Nations as part of the 2030 Agenda for Sustainable Development.

Goal	Name
1	End poverty in all its forms everywhere
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3	Ensure healthy lives and promote well-being for all at all ages
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5	Achieve gender equality and empower all women and girls
6	Ensure availability and sustainable management of water and sanitation for all
7	Ensure access to affordable, reliable, sustainable and modern energy for all
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10	Reduce inequality within and among countries
11	Make cities and human settlements inclusive, safe, resilient and sustainable
12	Ensure sustainable consumption and production patterns
13	Take urgent action to combat climate change and its impacts
14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development

Adapted from "Transforming our World: The 2030 Agenda for Sustainable Development", by United Nations (2015).

Student engagement [33] and satisfaction with learning [34], as expressions of a sustainable education context, are mainly related with Goals 4 and 5.

Sustainable behaviors are defined as "a set of actions aimed at conserving the integrity of the socio-physical resources of our planet" [35] (p. 8). These behaviors are environmentally friendly insofar as they are "intentional actions resulting in the protection of the earth's physical resources" [36]. Recycling, responsible consumption, or reusing irrigation/shower water are examples of pro-ecological or environmentally-friendly sustainable behaviors. Austerity, a lifestyle characterized by limited consumption and waste of resources [35,37], is also considered a sustainable behavior. Thus, austerity is a pro-environmental or pro-ecological behavior, as it "consciously seeks to minimize the negative impact of one's actions on the natural and built world" [38]. These actions generally involve placing the well-being of the natural environment or the society above one's own. Therefore, sustainable behaviors are also considered prosocial and altruistic behaviors [39,40]. Although these two attributes involve prioritizing the well-being of others above one's own, they are different concepts. Altruism refers to a behavior where priority is placed on others and on the preservation of the social and natural environment [40], whereas in prosocial behaviors, priority is given to the well-being of others [39]. Equitable behaviors are an example of

prosocial behavior whereby all people are treated in an equitable way, regardless of their gender, culture, race, or ethnicity [41], and natural resources are used in an equitable manner [42].

With the aim of analyzing and studying the relationships between student learning dimensions and the aforementioned sustainable behaviors, a descriptive [43], cross-sectional, and ex post facto empirical study is proposed. This approach will enable us to analyze the particularities of the variables described above in a specific population and describe their interrelations [43]. Although it is not frequent to posit a hypothesis in a quantitative descriptive study, we deemed it appropriate to provide a rationale and describe the expected associations between learning and sustainability measures.

Approach to learning is defined as the way students address study and learning processes. Three approaches have been identified (superficial, deep, and strategic or achieving) according to the level on which information is processed [44]. Whereas in superficial learning, the student does not absorb information and its meaning, deep learning involves a higher level of abstraction and processing, whereby the student seeks to understand the meaning of what they are learning [45]. These three approaches are associated with different learning motivations and strategies. Students with strategic motivation seek to gain social recognition for their academic outcomes [45]. Sustainable behaviors have been associated with learning practices such as mindful attentiveness [46], especially with observing one's sensations and acting consciously, which makes us aware of our interdependence with nature. Sustainable behavior is the opposite to acting automatically, paying attention to everyday decisions and acting in a reflective manner, instead of being driven by familiarity, easiness, or specific traits that draw our attention and lead us to act in an automatic way [47]. As a result, deep learning approaches and motivations vs. superficial approaches are expected to be positively related to expressions of sustainability.

Student engagement is a multidimensional term that describes the participation and identification of students with their academic institution and activities, their level of involvement in the learning process [48], and their motivational configuration, expressed as dedication, vigor and absorption [49]. Schaufeli, Salanova, González-Romá, and Bakker [49] define vigor as "the willingness to invest effort in one's work and persistence even in the face of difficulties; dedication is characterized by involvement in work and the associated sense of pride, challenge, enthusiasm and significance; absorption is characterized by being fully concentrated and deeply engrossed in one's work, whereby one has difficulties with detaching oneself from work and time passes quickly". Engagement with learning in the academic context, expressed as high scores in vigor, dedication, and absorption, is expected to have a positive impact on other systems, given the existing interplay between them [18]. In view of the positive influence of engagement on sustainable behavior, it is reasonable to expect that satisfaction with learning will also influence this behavior [36]. Satisfaction with learning is the result of an overall evaluation of the thoughts and judgments one has about one's academic performance, considering academic outcomes, the time devoted to, and the level of contentment derived from said performance [50].

2. Materials and Methods

2.1. Participants and Procedure

The sample included 225 Spanish university students at the University of Granada, with a mean age of 20.44 years (range = 17–56), who were undergraduates of the degrees of Pedagogy and Social Work. The number of students going into these degrees is 548 and 744 respectively (2019–2020 academic year). A nonprobabilistic sampling method was used to select the degrees whose students participated in the study. Participants were mostly women (90.7%), and undergraduates of social sciences enrolled in the degrees of Pedagogy and Social Work. The men-to-women ratio was consistent with the gender distribution in these degrees. These two degrees share curricular competencies as well as professional values and principles. They "have in common that they are professions that attract vocational practitioner with a strong advocacy for social justice; often the work

is a ‘calling’. There is an ethical motivation in joining the profession in order to make a difference in society, in making the work a fairer one” [51].

The students enrolled in subjects taught by the university professors who agreed to collaborate in this study received an email with information about the objectives of the research and an invitation to participate. Those who voluntarily agreed to participate answered an online survey questionnaire, accessible via the Limesurvey platform. Although a total of 287 students accessed the platform and completed the questionnaire in full or in part, only full questionnaires were considered. Students who completed the questionnaires in full were awarded academic credit for taking part in the study.

The confidentiality of data was adequately protected in accordance with Spanish data protection laws. Respondents were informed of the purpose of the study and the persons responsible for it. Informed consent was obtained from all participants.

2.2. Instruments

Sustainable behaviors. Austerity was measured using a 10-item scale selected from Tapia-Fonllem, Corral-Verdugo, Fraijo-Sing, and Durón-Ramos [32], and Corral-Verdugo, Tapia-Fonllem, Fraijo-Sing, Mireles-Acosta, and Márquez-Ulloa [42]. The items were adapted to the university setting as well as to a Spanish socio-cultural context. The original ten items selected to measure this behavior as well as their corresponding Spanish versions are shown in Table 2.

Table 2. Original items taken from [32,42] and Spanish adaptations made for this study to measure austerity in parentheses.

1	Does not buy a new car if old functions (“No compro nada nuevo innecesariamente si lo que uso todavía funciona”)
2	Wears same clothing (“Utilizo la misma ropa que la temporada pasada, aunque pueda comprarme nueva”)
3	Wouldn’t buy jewelry (“Aun teniendo dinero no lo empleo para comprar joyas”)
4	Buys lots of shoes (“Me compro muchos zapatos para que combinen con toda mi ropa”)
5	Buys more food than needed (“Compro más cosas que las que necesito”)
6	Uses a large part of earnings to buy clothes (“Una gran parte de mi dinero lo empleo para comprar ropa”).
7	Always takes meals at home (“Casi siempre como en mi casa, en lugar de ir a restaurantes o bares”)
8	Prefers to walk than to drive (“Si voy a un lugar que no está lejos, prefiero caminar que pedir que me lleven en coche”)
9	Reuses notebooks and paper (“Reutilizo los cuadernos y las hojas de papel que sobran al terminar cada curso académico”)
10	Likes living lightly (“Me gusta vivir sin lujos”)

The survey consisted of a 5-point Likert scale, where 0 indicates “totally disagree” and 4 means “totally agree”. Cronbach’s alpha coefficient was 0.76, indicating, as in the previous scale, acceptable internal consistency. Therefore, all items were appropriate to measure austerity.

Similarly, equitable behavior was assessed using ten items selected from Corral-Verdugo, Tapia-Fonllem, Fraijo-Sing, Mireles-Acosta, and Márquez-Ulloa [42], and Tapia-Fonllem, Corral-Verdugo, Fraijo-Sing and Durón-Ramos [32]. Some of the items were adapted to the university setting as well as to a Spanish socio-cultural context. The originals ten items used to measure this behavior, as well as its adaptation, appear in Table 3.

Table 3. Items used to measure equitable behavior taken from [32,42] (Spanish adaptation to the university context and/or a Spanish socio-cultural context are shown in parentheses).

1	At school, a student is as important as a professor (“En la Facultad, trato a todos mis compañeros como iguales”)
2	Children in my home have the same rights as adults in making important decisions (“Donde vivo, todos tienen el mismo derecho a tomar decisiones importantes”)
3	In my family, men and women perform the same chores (“Donde vivo, hombres y mujeres tienen las mismas obligaciones en el hogar”)
4	Indians are equally capable of running a business as white people (“Trato a los inmigrantes de la misma manera que a las personas que no lo son”)
5	I treat rich and poor people equally (“Mi trato para las personas pobres es igual que el que tengo con los más ricos”)
6	In my family, girls and boys have the same educational opportunities (“En mi familia, las mujeres tienen las mismas oportunidades (hasta donde quieran) que los hombres”)
7	All students have the same rights, regardless of gender (“Todos los estudiantes tenemos los mismos derechos independientemente de que seamos hombres o mujeres”)

Table 3. Cont.

8	Natural resources should be equitably distributed (“Los recursos naturales deben ser distribuidos de forma equitativa”)
9	At university, a student is as important as a professor (“En la Universidad, los estudiantes son tan importantes como los profesores”)
10	Poor people should live in the same city zone where the rich live (“Las personas pobres deben vivir en las mismas zonas de la ciudad que las personas con más recursos”)

Respondents were asked to indicate their level of agreement with the 10 notions described above on a 5-point Likert scale (0 = Totally disagree; 4 = Totally agree). Cronbach’s alpha coefficient was 0.67, showing sufficient reliability to measure equitable behavior.

Altruism, defined as the act of helping other people or institutions without expectation of reward, was measured according to 10 items selected from Tapia, Fraijo, Corral, Gutiérrez, and Tirado [52]. The items were adapted to the university setting as well as to a Spanish socio-cultural context, as shown in Table 4.

Table 4. Items used to measure altruistic behavior, taken from [52], and Spanish adaptation to the university context and the socio-cultural context of Spain in parentheses.

1	Gives clothes to the poor (“Regalar ropa usada que ya no utilizo pero que está en buen estado”)
2	Assists people who fall or get hurt (“Brindar atención a alguna persona que tropieza, o que se cae, o que se lastima en la calle”)
3	Contributes financially with the Red Cross (“Contribuir económicamente con una ONG”)
4	Visits the sick at hospitals/homes (“Visitar a enfermos en hospitales”)
5	Helps the elderly or handicapped cross the street (“Ayudar a personas mayores o incapacitados a cruzar la calle”)
6	Guides persons asking for direction (“Guiar a personas para localizar alguna dirección”)
7	Provides money to homeless (“Regalar una moneda a indigentes [pobres en la calle]”)
8	Participates in fundraising rallies (“Participar en colectas de fondos”)
9	Donates blood in response to campaigns (“Donar sangre”)
10	Cooperates with colleagues (“Colaborar con compañeros de estudio o del trabajo a explicarles y ayudarles en tareas que no entienden”)

The scale consisted of a 4-point Likert scale (0 = Never; 3 = Always), corresponding to the frequency with which each participant engages in the described actions. Cronbach’s alpha coefficient for this scale was 0.74. This value showed adequate internal consistency and, as a consequence, the validity of the questionnaire to measure altruistic behavior.

Finally, pro-ecological or environmentally-friendly behavior was measured using the 10 items detailed in Tapia-Fonllem, Corral-Verdugo, Fraijo-Sing, and Durón-Ramos (2013) that correspond to various pro-ecological behaviors. Participants were asked to indicate the frequency with which they perform each action on a 3-point Likert scale (0 = Never; 3 = Always). The reliability of the scale for this sample was 0.77. The items used to measure this behavior appear in Table 5 (see [32]) and were similarly adapted to the university setting and a Spanish socio-cultural context.

Table 5. Items used to measure the pro-ecological or environmentally-friendly behavior taken from [32], with Spanish adaptation to the university setting and a Spanish socio-cultural context in parentheses.

1	Collects and recycles used paper (“Guardo y reciclo el papel usado”)
2	Brings empty bottles to a recycling bin (“Separo botellas vacías para reciclar”)
3	Has pointed out unecological behavior (“Le he hecho saber a alguien que se ha comportado de manera que daña el ambiente”)
4	Reads about environmental issues (“Leo acerca de temas ambientales”)
5	Talks to friends about environmental problems (“Hablo con amigos acerca de problemas relacionados con el medio ambiente”)
6	Turns down air conditioning when leaving a room/building (“En el verano apago el aire acondicionado cuando dejo mi casa por más de cuatro horas”)
7	Looks for ways to reuse things (“Busco la manera de reutilizar cosas”)
8	Encourages friends and family to recycle (“Animo a mis amigos y familiares para que reciclen”)
9	Conserves gasoline by walking or bicycling (“Ahorro gasolina, caminando o viajando en bicicleta”)
10	Buys convenience foods (“No compro comidas precocinadas”)

These four scales were used for the Spanish population in a study conducted by Muñoz-García and Villena-Martínez (2020) [53], showing satisfactory psychometric properties. The conception of these four variables is consistent with the definitions provided in the Introduction. For all variables, a higher score indicates a higher level of agreement of the respondent with the issue being measured.

Satisfaction with learning. This aspect was assessed using the unidimensional, five-item survey developed by Muñoz-García and Avilés-Herrera (2013) [54]. Although it is not possible to reproduce here the full scale due to intellectual property rights, a sample item is “In most of my learning tasks, I am almost completely satisfied”. The content of the remaining four items refers to level of satisfaction with the use of the learning time, the results of learning, the fit between the student’s ability and the performance of the learning task, and the pleasure with the learning task expressed by the desire of doing the same learning task again. The respondents rated their level of agreement with each statement on a 5-point Likert scale (1 = Very Little, 5 = Very much). A higher score indicates a higher level of satisfaction. Cronbach’s alpha coefficient was 0.77.

Approaches to learning. The Spanish version [54] of Biggs’ SPQ scale [55] was used to measure approaches to learning (superficial, deep, and achievement), as well as three types of motivation (i.e., superficial, deep and achievement). For these factors, the Cronbach’s alpha range was between 0.55 and 0.76. Although space limitations as well as intellectual property rights prevent us from presenting the full scale here, the questionnaire application instructions, the items that compound each scale, and the correction procedure appear in the publication of A. Barca (1999) [54].

Student engagement. Student engagement was measured by the 17-item Spanish version of the UWES scale [49]. Each item represents a feeling about learning, and respondents were asked to rate how frequently their feelings correspond to those described in the item. To this end, a 7-point Likert scale was used (0 = Never, no time, 6 = Always, everyday). We chose the extended 17-item version, since its reliability is higher than that of the 9-item version. Subscales of vigor (e.g., “I can continue studying for many periods of time”), dedication (e.g., “I am excited about my degree”) and absorption (e.g., “Time “flies by” when I do my homework as a student”) showed a reliability of 0.78, 0.84, and 0.80 respectively. The full version of the scale is available on the author’s website (https://www.wilmarschaufeli.nl/publications/Schaufeli/Test%20Manuals/Test_manual_UWES_Espanol.pdf).

2.3. Analysis of Data

After finishing the participation process, only full questionnaires were retained for statistical analysis. The database with the responses to 225 questionnaires was analyzed using the IBM SPSS Statistics version 26 software package. A preliminary analysis of the dataset did not show any response tendency.

Descriptive statistical techniques were used for the characterization of the sample. The results of this analysis were expressed as mean values, standard deviation, estimated rank, and observed rank; these last two describe, respectively, the range of responses possible for each scale and the range of responses given by the participants.

The relationships between variables were assessed calculating Pearson’s correlation coefficient. This statistic is “a measurement of the strength of the relationship between two variables and their association with each other” [56].

3. Results

3.1. Characterization of the Sample

The results of descriptive statistics (see Table 6) showed a limited frequency of environmentally-sustainable behavior, close to mean scores in altruism, slightly higher in pro-ecological behavior and austerity, and especially relevant in equitable behaviors. In overall terms, there is margin for improvement in sustainable behavior, as mean values are in the lower limit of the upper third of the range of possible scores.

Student engagement with learning was slightly above the mean value of potential scores in all its expressions. Although the value obtained for dedication was slightly higher than for vigor and absorption measures, there was greater variability. The mean value of engagement with learning for the entire sample was in the lower limit of the last third of the range of potential scores, 37 points below the maximum score. Mean values for vigor, dedication, and absorption measures were 10 points below the potential maximum score.

With regard to learning approaches, a similar frequency of use was observed in deep, superficial, and strategic learning, with scores being significantly below the maximum score for the three approaches. Of note, students reported using the academic strategy approach less frequently than the deep and superficial learning approach (whose values were similar). The statistical analysis, however, showed that the deep learning approach was used more frequently than academic achievement and superficial learning.

Similar to the scores obtained for student engagement, the mean satisfaction with learning was far below the maximum allowed score, and was only 3 points above the intermediate value of potential scores.

Table 6. Descriptive statistics of measures of Sustainability, student engagement, learning approaches, and satisfaction with learning ($n = 225$).

Variables	Arithmetic Mean ¹	Standard Deviation	Range Observed ²
Sustainability			
Altruism	18.36 (1.83 (0–3))	4.56	5–30 (0–30)
Austerity	27.83 (2.78 (0–4))	6.40	7–40 (0–40)
Equity	35.86 (3.58 (0–4))	3.79	20–40 (0–40)
Proecological behavior	20.15 (2.01 (0–3))	5.39	0–30 (0–30)
Sustainable behavior ³	102.20 (2.55 (0–3.5))	12.64	63–131 (0–140)
Learning engagement			
Vigor	21.07 (3.51 (0–6))	6.52	5–35 (0–36)
Dedication	24.25 (4.85 (0–6))	4.93	5–30 (0–36)
Absorption	22.54 (3.76 (0–6))	6.24	6–36 (0–36)
Learning engagement ⁴	67.86 (3.99 (17–102))	15.74	24–100 (0–102)
Learning approaches			
Surface motivation	25.30 (3.61 (7–35))	3.64	11–34 (7–35)
Deep motivation	25.32 (3.62 (7–35))	3.89	16–35 (7–35)
Achievement motivation	22.24 (3.18 (7–35))	4.97	8–34 (7–35)
Surface Strategy	21.01 (3.00 (7–35))	3.67	12–33 (7–35)
Deep Strategy	24.23 (3.46 (7–35))	4.34	13–35 (7–35)
Achievement strategy	23.58 (3.37 (7–35))	4.67	10–35 (7–35)
Surface approach	46.32 (3.31 (14–70))	5.66	23–63 (14–70)
Deep approach	49.54 (3.54 (14–70))	7.50	30–68 (14–70)
Achievement approach	45.81 (3.27 (14–70))	8.42	21–68 (14–70)
Satisfaction with learning			
Satisfaction with learning	22.91 (4.58 (5–35))	4.91	10–35 (5–35)

¹ Potential range of responses by item is given in parentheses. ² Potential range of responses by variable is given in parentheses. ³ This variable is the sum of the Altruism, Austerity, Equity, and Pro-ecological behavior variables. ⁴ This variable is the sum of the Vigor, Dedication, and Absorption variables.

3.2. Relationship between Measures of Learning and Sustainability

The Table 7 shows the results of the analysis of the linear relationship between sustainability and learning measures. A relationship was observed between engagement with learning and sustainable behavior (i.e., vigor, dedication and absorption). Sustainable behavior was positively related to the dimensions above, especially with altruistic, equitable, and pro-ecological behaviors. In contrast, austerity only correlated with dedication and had an independent relationship with absorption. Although the relationship between austerity and vigor did not reach statistical significance, Pearson's coefficient showed that it was close to it.

Deep learning orientation, in terms of motivation, strategy, and approaches, correlated with the overall score of sustainable behavior, especially with altruistic, equitable and pro-ecological behavior. Thus, the frequency of altruistic, equitable and pro-ecological behavior increased as the presence of a deep learning orientation increased.

In contrast, a superficial learning orientation was found to be independent from measures of sustainable behavior, both globally and from their respective expressions. Notably, altruism was an exception, as it increased as superficial motivation increased, which did not occur with the strategy and approach that correspond to the superficial orientation.

As to the strategic orientation, the corresponding strategy and approach were positively related to general measures of sustainable behavior. This relationship can be explained by their effect on altruistic, equitable and pro-ecological behavior. However, altruistic sustainable behavior was found to be independent from the strategic motivation, strategy, and approach.

Although satisfaction with learning was positively related to measures of sustainable behavior through altruism and equitable behavior, contentment with learning activities was independent from austerity and pro-ecological behavior.

Table 7. Pearson correlations between sustainability measures and dimensions of learning.

	AUS	ALT	EQU	PROECO	SB ¹
Learning engagement					
Vigor	0.10	0.21 **	0.14 *	0.21 **	0.26 **
Dedication	0.14 *	0.16 *	0.19 **	0.21 **	0.28 **
Absorption	0.06	0.15 *	0.13	0.18 **	0.20 **
Learning engagement ²	0.11	0.20 **	0.17 *	0.22 **	0.27 **
Learning approaches					
Surface motivation	0.00	0.14 *	0.06	0.04	0.08
Deep motivation	0.13	0.30 **	0.16 *	0.29 **	0.34 **
Achievement motivation	0.00	0.18 **	0.06	0.11	0.13
Surface Strategy	−0.11	0.10	0.06	−0.06	−0.06
Deep Strategy	0.11	0.32 **	0.24 **	0.20 **	0.33 **
Achievement strategy	0.13	0.31 **	0.26 **	0.29 **	0.38 **
Surface approach	−0.08	0.10	0.07	−0.01	0.01
Deep approach	0.13	0.34 **	0.22 **	0.27 **	0.37 **
Achievement approach	0.08	0.27 **	0.18 **	0.23 **	0.28 **
Satisfaction with learning					
Satisfaction with learning	0.07	0.17 *	0.15 *	0.09	0.18 **

Note: AUS = Austeridad; ALT = Altruismo; EQU = Equidad; PROECO = Conducta proecológica; SB = Conducta sostenible. ¹ This variable is the sum of the Altruism, Austerity, Equity, and Proecological behaviour variables.

² This variable is the sum of the Vigor, Dedication, and Absorption variables. * $p < 0.05$. This means that the correlation coefficient is different from zero and, consequently, that there is a lineal relationship between the two variables. In this case, a p -value of 0.05 means that there is less than a 5% probability the null hypotheses (i.e., the correlation coefficient is equal to zero) is correct. ** $p < 0.01$. This means that the correlation coefficient is different from zero and, consequently, that there is a lineal relationship between the two variables. In this case, a p -value of 0.01 means that there is less than a 1% probability the null hypotheses (i.e., the correlation coefficient is equal to zero) is correct.

4. Discussion

The objective of this study was to describe and analyze potential relationships between sustainable behavior and learning measures in undergraduate students. Based on Bronfenbrenner's theory of systems interplay, we posited that a correlation would exist between sustainable behavior and learning measures [20]. The results of this study revealed that learning variables, and especially learning approaches, related differently to measures of sustainable behavior.

A positive relationship was observed between altruistic, equitable, and pro-ecological behaviors and a more frequent use of deep learning. This finding indicates that a learning approach whereby the student adopts a critical stance towards information and seeks to understand the meaning behind it contributes to environmental sustainability. The rela-

tionship between this approach, also expressed in a higher motivation, and sustainability could be explained by the positive effects of deep learning on understanding and long-term retention of information [55]. Accordingly, it was reasonable to expect that deep learning would influence other contexts. Conversely, a student who uses a superficial learning approach whereby information is memorized without understanding its meaning will hardly apply such information in real life [45]. This could explain why superficial learning is not related to sustainable behaviors. Austerity was the only sustainable behavior that was not statistically related to learning approaches. Unlike equitable, pro-ecological, and altruistic behavior, where one seeks the well-being of other people and the environment above one's own, regardless of the traits of the subject, austerity involves that behaviors are focused on one's self and are intended to reduce the impact of one's behavior on the environment as much as possible [39].

On the other hand, the fact that superficial and deep approaches are essential for learning and considered complementary [57] could explain the observed relationship between altruistic behaviors and superficial motivation, which is a component of the superficial approach. The significant relationship observed between altruistic behavior and superficial motivation and their independent relationship with the superficial approach and strategy could be explained by the characteristics of altruistic behavior. Thus, altruistic behavior involves more personal and specific behaviors initially adopted in specific situations, as compared to the more social, abstract, and personal behaviors characteristic of behaviors oriented towards societal well-being (e.g., prosocial sustainable behaviors). This difference could explain why superficial motivation, but not a superficial strategy or approach, is associated with an altruistic behavior. In this case, this association indicates that an altruistic sustainable behavior is driven by the willingness, activation, and orientation of the individual towards the goal they seek to attain with their altruistic behaviors, rather than by the specific actions that they could carry out. This interpretation would be supported by the positive association observed between altruistic, equitable, and pro-ecological behavior and achievement approach, and the lack of correlation between achievement approach and austerity, given that students who adopt an achievement approach seek to gain social recognition for the results obtained [45]. This would explain why it is independent from austerity (focused on the subject), but related to altruistic, equitable, and pro-ecological behavior, where the subject seeks to benefit others and the natural environment. Unlike the deep learning approach, the impact of the strategic approach on sustainability is more strongly associated with the strategy than with motivation. Thus, acting in the appropriate manner to accomplish specific goals is more relevant than the desire to achieve social recognition and acceptance for academic achievements. Academic achievements are only associated with altruistic behavior, which is consistent with the fact that in an altruistic behavior, the subject values other's well-being above one's own [39].

With respect to engagement with learning, it was associated with sustainable behavior in general, and with altruistic and pro-ecological behavior in particular. This highlights the relevant role of motivation, rather than specific actions, in learning in relation to sustainability. The results obtained indicate that sustainable behavior is facilitated by effort and resilience in the face of difficulties, engagement with academic tasks, focused attention on the task, distortion of time, and a sense of enjoyment with the task. These aspects define the behavior of students engaged with learning [49].

Similar to approaches where dispositional aspects were especially relevant to sustainability (e.g., willingness, wish and involvement of the student), the characteristics of the student with respect to learning (e.g., vigor, dedication) were more relevant than absorption, which is more dependent on external aspects such as a student's level of interest in a specific issue. Absorption was found to be associated with altruism and pro-ecological behavior, but not with equitable behavior and austerity, which were only related to dedication. The fact that altruistic and pro-ecological behaviors share the prevalence of the well-being of the natural environment and of other people over one's own [26], which are more abstract and general than equitable behavior and austerity, which are more personal

and self-centered, could provide insights into the observed pattern of relationships. Finally, the association between austerity and dedication and its independent relationship with vigor and absorption could be related to the fact that dedication has a more ascetic characteristic, as it involves traits of inspiration, pride, and enthusiasm vs. vigor and absorption, which involve persistency, effort, and focused attention [49].

Finally, the relationship between satisfaction with learning and sustainable behavior confirmed the relevance of emotional and affective aspects in relation to cognitive aspects. Thus, the definition of this construct includes the feeling resulting from a global opinion and thoughts of a person with respect to their academic performance [53]. Satisfaction with learning was relevant to altruistic and equitable behavior and independent from austerity and pro-ecological behavior. The fact that austerity involves a separation from superfluous and pleasant sensations [58], whereas pro-ecological behavior seeks the benefit of the natural environment over one's own [39], could explain why these two aspects are unrelated to student's personal satisfaction.

The results of this study are consistent and support the relevance that the UNESCO gives to education as a means to attain the Sustainable Development Goals [8]. In line with the UNESCO, the association between learning approaches, satisfaction and engagement with learning, and environmentally sustainable behavior highlight the relevance of "empowering learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society for present and future generations" [8] (p. 7). This involves the use of educational strategies associated with the deep learning approach, such as the development of competencies that "empower individuals to reflect on their own actions, taking into account their current and future social, cultural, economic and environmental impact [. . .] to act in complex situations in a sustainable manner" [8] (p. 7). This approach, as well as the curricula and professional performance of social workers and pedagogues, share the competencies and attitudes of being self-reflective and critical, and of being aware of one's own values [51]. A deep approach to learning and being an engaged student are connected with reaching the goal of becoming a well-trained professional and, at the same time, being capable of acting in a sustainable manner. The results of the study show that a deep learning approach cultivates altruistic, equitable, and pro-ecological behaviors in real-life situations, i.e., outside of the academic context; this is coherent with the fact that pedagogy [59] and social work practice [60], the two university degrees where the data were collected from, contribute to sustainable development [61]. These ideas, taken together, suggest that the student factors may not be the only ones responsible for the relationships observed in this study. Higher Education institutions (these two degrees in this case) play a relevant role in achieving sustainable goals [62,63] and "the fulfillment of the sustainable development goals requires the training of students in both specific and transversal skills" [9] (p. 2). These are present in their corresponding curricula. Social work "coincides fully with the necessary social change . . . and this is consistent with the implicitly political nature of the international definition of the social work" [60] (p. 7), which "can contribute to sustainable development by building social capital by focusing on empowerment in cooperation with other social actors" [60] (p. 10). The same happens with the Pedagogy curriculum, also related with social welfare development, social justice [51], and sustainable development [9]. The emphasis of these two degrees on the common good could also be related with the appearance of sustainable behaviors and pro-environmental attitudes.

The limitations of this study limit the generalization of the obtained results. Larger studies are necessary with a sample of students with other areas of knowledge and with a well-balanced sex distribution that would make it possible to assess potential gender-based differences. If similar associations were observed in larger samples of undergraduates, studies could be extended to lower education levels, given the relevance of primary and secondary education in the acquisition of habits and skills which are applicable beyond the academic context, including the natural environment. The potential modulatory effect of learning contents on the relationships observed could also be considered in experimental

or quasi-experimental studies. This would enable researchers to control for the effect of individual variables measured in this study such as values, dimensions of personality, and expressions of faith and spirituality.

To conclude, the results of this study show the relevance of educational processes and the academic context, rather than personal or individual factors, in relation to the dissemination of sustainability-related knowledge in Higher Education. This study illustrates that educational actions are necessary to activate the intrinsic motivation of students and stimulate meaningful learning processes that result in student's engagement and satisfaction with learning.

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